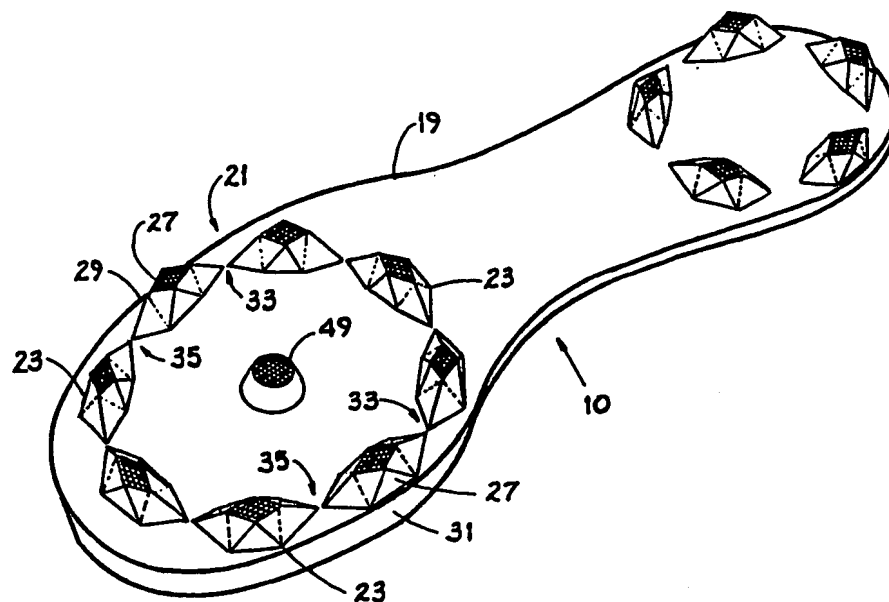




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>5</sup> :  A43B 5/02, 5/00, A43C 15/16	A1	(11) International Publication Number: WO 91/03960  (43) International Publication Date: 4 April 1991 (04.04.91)
<p>(21) International Application Number: PCT/US90/05232</p> <p>(22) International Filing Date: 14 September 1990 (14.09.90)</p> <p>(30) Priority data: 407,869 15 September 1989 (15.09.89) US</p> <p>(71) Applicant: TANEL CORPORATION [US/US]; 1818 North Water Street, Milwaukee, WI 53202 (US).</p> <p>(72) Inventor: TANEL, Michael, L. ; 119 North 92nd Street, Milwaukee, WI 53226 (US).</p> <p>(74) Agent: JANSSEN, Peter, N.; Law Firm of Peter N. Jansson, Ltd., 245 Main Street, Suite M, Racine, WI 53403 (US).</p>		<p>(81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent)*, DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent).</p> <p><b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>

(54) Title: CLEATED SOLE FOR AN ATHLETIC SHOE



## (57) Abstract

An improved athletic shoe sole (10) of the type having annular cleating is disclosed. The sole (10) includes an annular cleat set (21) projecting from the main sole surface (19) and disposed along a substantially circular path (25) which encompasses a major area of the toe and ball-of-the-foot portions (17, 15), the set (21) having a plurality of cleat nodes (23), each of which is arranged in a substantially abutting relationship to at least one adjacent cleat node (23). Each cleat node (23) has a distal end or tip (39) spaced from the main sole surface (19) and first and second edges (45a, 45b) on opposite sides of the distal end (39) with proximal ends (47) terminating on the circular path (25). Improved pivotability and traction characteristics are provided.

### DESIGNATIONS OF "DE"

Until further notice, any designation of "DE" in any international application whose international filing date is prior to October 3, 1990, shall have effect in the territory of the Federal Republic of Germany with the exception of the territory of the former German Democratic Republic.

#### FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MC	Monaco
AU	Australia	FI	Finland	MG	Madagascar
BB	Barbados	FR	France	ML	Mali
BE	Belgium	GA	Gabon	MR	Mauritania
BF	Burkina Faso	GB	United Kingdom	MW	Malawi
BG	Bulgaria	GR	Greece	NL	Netherlands
BJ	Benin	HU	Hungary	NO	Norway
BR	Brazil	IT	Italy	PL	Poland
CA	Canada	JP	Japan	RO	Romania
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	LI	Liechtenstein	SN	Senegal
CM	Cameroon	LK	Sri Lanka	SU	Soviet Union
DE	Germany	LU	Luxembourg	TD	Chad
DK	Denmark			TC	Togo
				US	United States of America

-1-

1

5

10

15

20

## CLEATED SOLE FOR AN ATHLETIC SHOE

### Field of the Invention

25 This invention is related generally to athletic shoes of the type having cleats for penetrating ground engagement and, more specifically, to athletic shoes with cleats facilitating pivoting movement.

### Background of the Invention

30 Many athletic shoes used for field sports, such as football, soccer, lacrosse, baseball and softball, have a number of typically truncated cone-shaped cleats for the purpose of increasing traction. Cleats dig into the turf to prevent slipping during starting, stopping, and cutting maneuvers.

35 However, in addition to providing desirable traction for starting, stopping and cutting, such cleats typically

-2-

1 provide very undesirable resistance to pivoting. This can  
be a disadvantage in at least two ways.

First, the resistance of many prior art cleating  
arrangements to turning movements can create stresses  
5 within the leg when unwanted torque or force is applied to  
the athlete, particularly to the athlete's leg. Injuries,  
particularly knee and ankle injuries, can result if a  
twisting movement is forcibly applied to a leg at a time  
when the cleats are firmly planted in the turf and release  
10 is difficult or impossible.

Second, when pivoting is inhibited, maneuverability  
of the athlete is limited, thus making performance less  
than it could be. Enhancing the ability of a player to  
pivot while still maintaining good traction and foot  
15 stability can greatly increase effectiveness on the field.

Recent athletic shoe cleating developments of Michael  
L. Tanel, the inventor herein, involving annular cleating  
provided a combination of greatly improved pivotability and  
excellent traction. These developments tend to reduce the  
20 chance of athletic injuries and significantly improve  
maneuverability on the field. Examples of such cleating  
are disclosed in United States Patent Nos. 4,577,422,  
4,653,206, 4,660,304, 4,669,204, 4,723,365 and 4,748,752.

The improvement in pivotability made possible with  
shoes in accordance with the principles of such patents is  
25 dramatic, and such shoes give the athletes wearing them a  
natural feeling of freedom together with good feeling of  
traction for stopping, starting and cutting.

Despite the improvements which these developments  
represent, additional improvement is needed to provide  
30 functional advantages not realized or fully realized in the  
prior art. Certain conditions and situations must be  
addressed and are addressed by the improvements of this  
invention.

35 One significant concern regarding cleated soles for  
athletic shoes, including those disclosed in the patents  
noted above, relates to the degree and ease of penetration

-3-

1 of cleats. Ease of penetration has a significant effect on  
how well a shoe functions. If there is insufficient ground  
penetration or if ground penetration is difficult, there  
may be less traction than is desirable and less contact  
5 with the turf than is needed for the best possible  
fixed-position pivoting.

In this regard, consideration must be given to, among  
other things, the total area of the cleat ends, that is,  
the total area of the distal surface(s) of the cleat or  
10 cleats. Generally speaking, the greater the total end area  
bearing on the ground, the more difficult it may be for a  
cleat to penetrate the ground; the smaller the total end  
area bearing on the ground, the easier it may be for a  
cleat to penetrate. This effect is accentuated when the  
15 ground is hard.

Sharpening the distal end(s) of cleat(s), whether the  
shoe has discrete cleats or an annular cleat with an  
annular distal edge, tends to reduce the total area of  
cleat distal surface. However, it may also cause concern  
20 about injury from player contact with such sharp edges.  
This latter concern particularly arises in the cases of  
hard plastic or metal cleats.

Whether in pivoting motions or non-pivoting motions,  
maintenance of stability and traction is important under  
25 all conditions. Particular consideration must be given to  
the traction available from an athletic shoe sole when the  
wearer is playing on grassy turf with a very compact and  
hard underlying earth surface. Little if any earth  
penetration may be possible under such conditions,  
depending on the extent of turf hardness and compaction.  
30 The concern about hard ground under grassy turf is  
particularly significant when the grass is wet, as often  
occurs late in the evening or early in the morning because  
of dew.

35 The design of the sole can and should address such  
condition. When penetration is difficult, traction may  
depend in part on the extent of rubber "grab" on the ground

1 and in part on the extent of "tangle" which is possible  
with the grass. When the grass is also wet, rubber "grab"  
is minimized and "tangle" becomes more important to an  
athlete's traction. Of course, the athlete does not wish  
5 to sacrifice pivotability under these conditions any more  
than he does under other turf conditions.

Another important consideration relates to the degree  
to which the underlying turf is destroyed when played upon  
by wearers of cleated shoes. With standard cleating  
10 arrangements, when pivoting occurs considerable ground or  
turf destruction can occur; that is, the turf may be ground  
up. This is not only harmful to the ground, but in itself  
causes a loss of foot traction. With an annular cleat,  
ground destruction is minimized, thus enhancing foot  
15 traction. There is a need to have the benefits of both  
sorts of cleats without unduly destroying turf.

While free pivotability is highly desirable, some  
athlete's would like there to be a degree of control in  
such pivotability. Providing a cleating arrangement with a  
modicum of initial resistance to pivoting would be regarded  
20 as desirable by some. However, generally free pivotability  
beyond that point is considered extremely important. Once  
again, there is a perceived need for some benefits of  
annular cleating combined with some benefits of old-style  
standard cleating arrangements.  
25

Still another concern relates to the strength of  
cleats. Cleat bending and breakage can be a problem. It  
is considered very beneficial, of course, for cleats to be  
highly resistant to bending and breakage. Improvements in  
cleat structural strength are desirable.  
30

In very soft ground, the lateral profile of some  
standard cleats of the prior art is sometimes too small to  
provide a sufficient level of resistance to through-ground  
sliding. Ground can be displaced when side pressure  
occurs, thus providing a failure of traction. Providing  
35 cleats with greater resistance to such side pressure would  
be highly desirable.

-5-

1           Still another problem with certain cleated shoes of  
the prior art is that the pressure of the individual cleats  
can be felt by the foot of the athlete. Because of this,  
shoe comfort is reduced. The aforementioned annular cleats  
5       tend to overcome this problem, but for shoes with discrete  
cleats, this problem can be significant.

A few general comments are in order before turning to  
a description of this invention. In particular, a brief  
description of the foot and its pivoting and planted  
10       positions will be helpful. This can serve as an aid in  
understanding preferred embodiments of this invention.

The sole of the foot includes four portions. These  
are, in order from back to front: the heel portion; the  
arch portion; the ball-of-the-foot portion; and the toe  
15       portion. The heel and ball-of-the-foot portions are those  
portions which share most if not all of the player's weight  
when the player is in a normal standing position with feet  
generally flat on the ground. In such position, the arch  
portion and toe portion bear little if any weight.

20       When a player is "on his toes" in a "ready" position,  
virtually all of the player's weight is normally shared by  
the toe portion and the ball-of-the-foot portion. The same  
is usually true when a player is "digging" in a running  
action. Indeed, when a player is in the ready position,  
25       the juncture of the phalanges (toe bones) and the  
metatarsals is the center of weight bearing. In other  
words, the center of weight bearing in the forward portions  
of the foot actually moves forward when a player shifts to  
the ready position.

30       The sole of an athletic shoe has portions immediately  
below these four portions of the foot which may be  
designated, and herein are designated, by the same terms.

#### Objects of the Invention

35       It is an object of this invention to overcome some of  
the problems and shortcomings of the prior art, including  
those mentioned above.

-6-

1           Another object of this invention is to provide an improved athletic shoe sole.

          Another object of this invention is to provide an athletic shoe having both improved pivotability and  
5       excellent traction.

          Another object of this invention is to provide an improved athletic shoe which tends to reduce the risk of certain common injuries of athletes, particularly knee and ankle injuries.

10          Another object is to provide an improved athletic shoe of the type having annular cleating.

          Another object of this invention is to provide an improved annular-cleated athletic shoe with enhanced ground penetration.

15          Still another object is to provide an athletic shoe sole exhibiting both good traction and pivoting characteristics on grass-covered hard earth, particularly when such grass is wet.

          Another object of this invention is to provide an athletic shoe with annular cleating which nevertheless  
20       exhibits good "tangle" traction with turf.

          Yet another object is to provide an improved annular-cleated shoe having both excellent "grab" traction and excellent "tangle" traction.

25          Another object of this invention is to provide improved ground penetration in an annular-cleated shoe without sharpening the distal edge of annular cleating.

          Another object is to provide an cleated athletic shoe combining certain benefits of standard cleating with certain benefits of annular cleating.  
30

          Another object is to provide an athletic shoe with improved ground penetrability which avoids or minimizes turf destruction and the resulting traction loss.

          Another object of this invention is to provide an improved annular-cleated shoe with excellent pivotability  
35       which nevertheless provides what some perceive to be a desirable degree of initial resistance to pivoting.



-7-

1           Still another object of this invention is to provide  
a cleated athletic shoe having cleating with excellent  
strength and resistance to bending and breakage.

          Another object of this invention is to provide an  
5   improved cleated shoe with wide cleat profile to avoid  
unnecessary through-ground sliding, thus enhancing stopping  
and starting traction.

          Yet another object of this invention is to provide a  
cleated athletic shoe exhibiting excellent sole comfort.

10          These and other important objects will be apparent  
from the descriptions of this invention which follow.

#### Summary of the Invention

          This invention is an improved athletic shoe sole for  
15   field sports providing excellent controlled pivotability  
and traction in a commercially desirable form. The  
invention is an improvement in athletic shoe soles of the  
type having annular cleating.

          The invention provides enhanced ground penetration,  
20   and resulting improvements in traction and pivotability.  
The sole of this invention also provides both good traction  
and pivoting characteristics on grass-covered hard earth,  
with significant improvement provided even when such grass  
is wet. Improved "tangle" and "grab" traction are provided  
25   in a sole of the type having annular cleating. Improved  
traction is provided without sharpening the distal edge of  
annular cleating. The soles of this invention minimize  
turf destruction even while providing excellent traction  
characteristics.

          The soles of this invention, while having excellent  
30   pivoting characteristics, also provide what some perceive  
to be a desirable degree of initial resistance to pivoting.  
This gives an even greater feeling of control to some  
athletes. The cleating arrangement of this invention  
provide a wide cleat profile and thus avoid through-ground  
35   sliding. This enhances traction, particularly stopping and  
starting traction.

-8-

1           The soles of this invention are comfortable to wear,  
substantially avoiding any feeling of individual cleats as  
can occur with certain shoes of the prior art. The annular  
cleating of this invention also has excellent strength and  
5   resistance to bending and breakage. This is due in part to  
wide base dimensions.

          The inventive sole has an annular cleat set which  
projects from the main sole surface and is disposed along a  
substantially circular path which encompassing a major area  
10   of the toe and ball-of-the-foot portions. The annular  
cleat set has a plurality of cleat nodes, each of which is  
arranged in a substantially abutting relationship to at  
least one adjacent cleat node. Each of the cleat nodes has  
a distal end spaced from the main sole surface and first  
15   and second edges on opposite sides of the distal end. The  
edges having proximal ends which terminate substantially on  
the circular path.

          The first and second edges, sometimes referred to  
herein as leading and trailing edges because of their  
20   relationship to the cleat node and the ground during  
pivoting, function to cut into the turf, thereby reducing  
initial resistance to penetration by the cleats. The  
inventive sole thereby exhibits excellent initial  
penetration as well as traction and pivotability.

25           In a first preferred embodiment, adjacent pairs of  
cleat nodes are arranged to be in substantial abutment at  
the base portion of the nodes, that is, where the cleat  
nodes join the main sole surface. In a second preferred  
embodiment, cleats abut at the shoulder, that is, at a  
30   region generally midway between the base portion and the  
distal end (or "tip") of the cleat. This second embodiment  
is somewhat more "aggressive" than the first embodiment in  
its ability to maximize traction. Nevertheless, its  
configuration exhibits substantially the same advantages as  
described above with respect to the first embodiment. In a  
35   third embodiment, cleat nodes abut at their distal ends  
tips.

1           As used herein, the expression "substantially  
abutting relationship" means any one of the foregoing  
relationships. The term also describes the relationship of  
cleat nodes which may be slightly spaced from one another  
5           at their base portions, or any combination of the  
foregoing.

A preferred feature of the second embodiment is that  
the cleat nodes located on the circular path in a position  
adjacent to the arch portion of the sole are in abutment at  
10           their base portions rather than at the shoulder portions,  
as with the other cleat nodes of such embodiment. The  
resulting V-shaped spaces between cleat nodes in this area  
extend from the cleat tips to the sole surface and help  
prevent the sole from adhering to the turf by suction, as  
15           might otherwise occur on a muddy field. Such spaces allow  
air venting to help prevent the "clapping" sound which can  
result from trapped air, particularly when a player is  
running backwards.

All non-cleated areas of that portion of the sole  
20           area enclosed by the circular path are preferably  
coincident with the main sole surface; that is, such  
surfaces are not built up. This allows full turf  
penetration by the cleats.

Each of the cleat nodes has a base portion joined to  
25           the main sole surface. The base portion of each cleat node  
has a length measured generally along the circular path of  
the cleat set and a thickness measured generally radially  
to such path. The length is substantially greater than the  
thickness, thus providing excellent pivotability of the  
sole with good resistance to forces urging the sole  
30           laterally or longitudinally.

Controlling the relative length and thickness as  
described results in a cleat which presents a relatively  
small frontal area when the sole is being pivoted, thereby  
reducing pivoting effort. In contrast, the circumferential  
35           profile of the cleat nodes is quite large, thereby  
providing a high degree of stability and traction.

-10-

1           In a highly preferred embodiment, the cleat nodes are  
tapered to blunt, rather than pointed, distal ends. This  
configuration optimally resolves the conflicting concerns  
relating to ease of penetration on the one hand and  
5   avoidance of player "spiking" injuries on the other.

          In a highly preferred embodiment, each cleat node has  
multiple planar surfaces and leading and trailing edges  
each formed by the acute-angle intersections of pairs of  
such planar surfaces. The leading and trailing edges are  
10   substantially coincident with a projection of the circular  
path and form acute angles with the main sole surface. The  
resulting cleat node edges facilitate initial ground  
penetration. In addition, these edges slice rather than  
"punch" through the turf as the sole is pivoted.

15           Because of the abutting relationship of the cleat  
nodes and the angular arrangement of the edges, some highly  
desirable results are accomplished. First, resistance to  
initial penetration increases gradually rather than  
instantaneously as the cleat node first contacts and then  
20   penetrates the turf. Second, only slight pivoting rotation  
of the sole causes a trailing cleat node to enter and  
follow a path cut by a leading cleat node; therefore, there  
is a reduction in resistance to pivoting movement following  
slight initial resistance during initial rotation.

25           In addition, the unique design of the inventive sole  
tends to preserve rather than destroy turf. The structural  
integrity of the earth beneath the sole tends to be  
preserved and good traction is maintained rather than  
reduced.

30           In order to maximize the stability of the sole  
against lateral forces, the outer surface of at least one  
of the cleat nodes is generally coincident with the lateral  
side portion of the sole. An outer surface of at least one  
other cleat node is generally coincident with the medial  
side portion of the sole. Stated another way, the cleat  
35   nodes on the medial side and lateral side portions of the  
soles preferably have maximum spacing therebetween. This

-11-

1 helps reduce the possibility or the severity of ankle-twist injuries.

To help assure that the athlete enjoys excellent sole flexibility in the ball-of-the-foot and toe portions, it is preferred that the cleat nodes be arranged to promote such flexibility while yet maintaining a good capability for stopping, starting and cutting. In certain embodiments of this invention, each adjacent pair of abutting, tapered cleat nodes defines a generally V-shaped space between them. The annular cleat set includes a plurality of opposed pairs of such spaces forming a plurality of cross-sole breaks in the annular cleat set.

The configuration of the inventive athletic shoe sole and of the cleat nodes forming a part of the sole may be readily adapted to accommodate specific requirements. For example, the angles of taper of leading and trailing edges may be changed, the degree of sharpness of such edges may be modified and/or the cleat tip may be more or less blunted or pointed.

In some cases, it may be desirable to taper cleat nodes non-uniformly so that the profiles of the leading edges are different than the profiles of their trailing edges. This would serve to make pivoting easier in one direction than another, which may be desirable for athletes playing certain positions. Varying sharpness of leading and trailing edges can provide the same result.

Little or no spacing between cleat nodes is highly preferred. In such cases, there is little if any of the main sole portion lying exposed along the circular path followed by the annular cleat set. Thus, the cleat set of this invention, for all practical purposes, forms a substantially continuous ring despite the characteristics of the cleat nodes therealong.

#### Brief Description of the Drawings

FIGURE 1 is a perspective view of the first embodiment of the invention.

-12-

1           FIGURE 2 is a bottom plan view of the sole of FIGURE 1, with cleat sets removed, showing the heel, arch, ball-of-the-foot and toe portions of the sole.

          FIGURE 3 is a bottom plan view of a cleat node.

5           FIGURE 4 is an end elevation view of the cleat node of FIGURE 3, taken along the viewing axis 4 of FIGURE 3.

          FIGURE 5 is a side elevation view of the cleat node of FIGURE 3, taken along the viewing axis 6 of FIGURE 3.

10          FIGURE 6 is a side elevation view of the cleat node of FIGURE 3, taken along the viewing axis 6 of FIGURE 3.

          FIGURE 7 is a perspective view of the second embodiment of the invention.

          FIGURE 8 is a bottom plan view of cleat nodes arranged in an abutting relationship at their distal ends as used in a third embodiment of the invention.

15

#### Detailed Descriptions of Preferred Embodiments

          The figures illustrate a preferred athletic shoe sole 10 in accordance with this invention.

20          Referring first to FIGURE 2, the sole 10 has four portions which are defined by the portions of the foot adjacent to them. These sole portions are: the heel portion 11; the arch portion 13; the ball-of-the-foot portion 15; and the toe portion 17. The upper portions of the shoe are not illustrated.

25

          Referring now to FIGURE 1, the lower surface of the sole 10, which contacts the surface of the playing field, includes a main sole surface 19 which is a generally flat, even surface from which an annular cleat set 21 projects. The cleat set 21 has a number of cleat nodes 23 which are integrally formed with the main sole surface 19 in a molding process of well-known type. The sole 10 is made of material which is tough and wear resistant but which can flex in the normal manner depending upon how weight is applied to it. The sole 10 is preferably formed of polyurethane or rubber.

30

35

-13-

1           A plurality of cleat nodes 23 project from the main  
sole surface 19 and are disposed along a substantially  
circular path 25. This path 25 encompasses a major area of  
toe and ball-of-the-foot portions 17 and 15, respectively,  
5           and is centered on the juncture of such portions. Each  
cleat node 23 is arranged in a substantially abutting  
relationship to at least one adjacent cleat node 23 for  
providing improved engagement between the sole 10 and an  
earthen surface such as turf. Improved engagement results  
10           because of the relatively large number of cleat nodes 23  
projecting from the sole 10, among other things.

          For sports involving frequent and sudden shifts in  
body position or direction of movement, it is preferred  
that the arrangement of the cleat nodes 23 is selected to  
15           maximize the lateral stability of the shoe. To that end,  
an outer surface 27 of at least one of the cleat nodes 23  
is generally coincident with the lateral side portion 29 of  
the sole 10. An outer surface 27 of at least another one  
of the cleat nodes 23 is generally coincident with the  
20           medial side portion 31 of the sole 10. Improved lateral  
shoe stability results and this feature aids in avoiding  
ankle injuries or in lessening their severity.

          It is also preferred that the sole 10 exhibit a high  
degree of cross-sole flexibility, particularly at and near  
25           the junction of toe and ball-of-the-foot portions, 17 and  
15, respectively. Accordingly and in the first and second  
embodiments, shown in FIGURES 1 and 7 respectively, a first  
opposed pair of V-shaped spaces 33 defines one break (or  
flexing line or region) and a second opposed pair of  
30           V-shaped spaces 35 defines another break located forward of  
the first. The flexibility of the sole 10 is thereby  
preserved while yet maintaining an excellent traction  
capability.

          Referring next to FIGURES 3, 4, 5 and 6, a preferred  
35           cleat node 23 is shown to include a base portion 37, a  
distal end or tip 39 and a shoulder 41 located generally  
midway between the base portion 37 and the tip 39. Each

-14-

1 cleat node 23 includes multiple planar surfaces 43 and  
edges 45 at the intersections of pairs of such planar  
surfaces 43. In particular, a cleat node 23 includes a  
first edge 45a and a second edge 45b, each formed by the  
5 intersection of two planar surfaces 43 having an acute  
included angle between them. The proximal ends 47 of the  
first edge 45a and second edge 45b terminate on the path 25  
and each of the edges 45a, 45b cooperates with the main  
sole surface 19 to likewise define an acute included angle  
10 "A" between them. The tip 39 is a flat surface which is  
diamond-shaped as shown in FIGURE 3. This surface may be  
smooth or, preferably, cross hatched to a shallow depth for  
improved traction.

Referring generally to FIGURES 3-5 and particularly  
15 to FIGURES 4 and 5, a highly preferred cleat node 23 is  
tapered in two dimensions D1, D2. A first dimension D1 is  
measured along the base portion 37 generally parallel to  
the path 25. It will be appreciated that if measurement is  
taken in a plane parallel to the path 25 and at progressive  
20 points along the first and second edges 45a, 45b, where the  
edges 45a, 45b intersect with the plane the dimension D1  
between points on those edges 45a, 45b diminishes as the  
points of measurement move upward from the base portion 37  
to the tip 39. Similarly and referring particularly to  
25 FIGURES 3 and 4, a second dimension D2, cleat node  
thickness, may be similarly measured generally radially to  
the path 25 and it will be noted that the thickness of the  
cleat node 23 also diminishes as the points of measurement  
are moved upward from the base portion 37 to the tip 39.

30 Several benefits arise from the use of a cleat node  
23 having the described configuration. Referring  
particularly to FIGURES 1, 3 and 4, it is apparent that the  
tip 39 has a relatively small surface area. As the tip 39  
first makes contact with the turf, it tends to readily  
penetrate the turf, especially soft turf. Penetration is  
35 aided by the fact that the first and second edges 45a, 45b  
progressively slice the turf as the depth of penetration



-15-

1 increases. This combination of a tip surface with a  
relatively small area and of first and second edges 45a,  
45b exhibiting wedge-like or knife-like characteristics  
results in good penetration characteristics.

5 Pivoting movement causes the annular cleat set 21 to  
move about a center cleat 49 which is located at or near  
the center of the circular path 25. As a cleat node 23  
moves in either direction, its first edge 45a or second  
edge 45b, whichever is leading, cuts through the turf. The  
10 corresponding edge of the adjacent trailing cleat node 23  
thereafter enters and follows the path cut by the leading  
cleat node 23. Pivoting effort is thereby reduced.

Referring especially to FIGURE 4, the profile of a  
cleat node 23 as seen spanning the circular path 25 of the  
15 annular cleat set 21 is relatively small and this fact also  
aids in the ability of the cleat node 23 to more easily  
advance through the turf as the sole 10 is pivoted.

As explained above, a preferred sole 10 not only  
facilitates pivoting movement without the imposition of  
20 undue stress on the athlete's leg but also provides  
stability and traction for foot movements not involving  
pivoting. Referring particularly to FIGURE 5, the profile  
area of a side of the cleat node 23 is relatively large and  
this provides a substantial surface to resist slipping  
25 during stopping, starting, and cutting.

Still another benefit of the described cleat node 23  
configuration may be attributed to its tapered shape. That  
is, its base portion 37 has an area which is significantly  
larger than that of the surface of the tip 39. This "broad  
30 shouldered" configuration makes the cleat node 23 highly  
resistive to forces which may bend, twist or otherwise  
deform the cleat node 23 and impair traction.

One of the most difficult of all playing field  
conditions is presented when very hard earth is covered  
with wet grass. This most frequently occurs upon the  
35 formation of dew. Not only is it difficult to penetrate  
the ground with any sort of cleat configuration, but

-16-

1 conventional smooth-surfaced, conical cleats have a low  
coefficient of friction in contact with wetted grass. With  
the annular cleat sets 21 described herein, the multiple  
edges 45 on each cleat node 23 combined with an arrangement  
5 of cleat nodes 23 in an abutting relationship, with or  
without V-shaped spaces 35 therebetween, helps "tangle"  
with blades of grass. Improved traction results.

With respect to the first embodiment, it should also  
be appreciated that during rare but very strenuous  
10 movements, the sole 10 may become severely flexed along any  
line passing through the center cleat 49. Many cleat nodes  
23 may not then be in contact with the turf. Even in that  
event, the sole 10 maintains at least three cleat nodes 23  
in turf contact for helping the athlete maintain footing.

15 Referring next to FIGURE 7, a second embodiment of  
the athletic shoe sole 10 includes cleat nodes 23 arranged  
in a substantially abutting relationship to at least one  
adjacent cleat node 23. In the second embodiment and for  
all but one of the cleat nodes 23, the abutting  
20 relationship occurs at the shoulder portion 41 rather than  
at the base portion 37. For any given size of shoe sole  
10, this provides a greater cleat "density" and results in  
a sole 10 which more aggressively grips the turf. In the  
embodiments described above, that portion of the main sole  
25 surface 19 which is encompassed by the circular path 25 is  
not built up; that is, it lies generally on the same plane  
as those portions of the sole surface 19 lying outside the  
circular path 25.

Referring to FIGURE 7, it will be noted that in this  
30 second embodiment, most of the cleat nodes 23 abut at the  
shoulder 41 rather than at the base portion 37. Unless  
special precautions are taken, air may become entrapped  
within the space encompassed by the annular cleat set 21,  
as previously explained. Accordingly, one cleat node 23a,  
35 preferably located at the rear part of the circular path  
25, is arranged to abut adjacent cleat nodes 23b at the

-17-

1 base portion 37 or to be slightly spaced therefrom. This  
arrangement provides a plurality of air passages to prevent  
air entrapment.

Yet other arrangements of the inventive athletic shoe  
5 sole 10 are possible in view of the foregoing. For  
example, a sole 10 configured for use on artificial turf  
may employ concentric rings of cleat nodes 23 at the  
forefoot, and perhaps also on the heel. Still another  
variation may involve the use of cleat nodes 23 of slightly  
10 different size and/or physical arrangement. For example,  
cleat nodes 23 may be sized and arranged to define a pair  
of spaces adjacent the lateral sole portion 29 but only a  
single space adjacent the medial sole portion 31. The  
resulting spaces would provide for sole flexibility by  
15 defining a "V", the ends of which are at the lateral sole  
portion 29 and the apex of which is at the medial sole  
portion 31.

Referring to FIGURE 8, a third embodiment involves  
arranging cleat nodes 23 in an abutting relationship at the  
20 tip 39 or distal end. Of the three embodiments, this third  
embodiment maximizes the area which initially contacts the  
turf and the area forming the bearing surface during  
pivoting movement. Therefore, this third embodiment has  
the least resistance to pivoting effort. However, the  
25 presence of its multiple edges 45 in engagement with the  
turf, including wet grass, provides improved traction over  
earlier shoe soles.

While the principles of this invention have been  
described in connection with specific embodiments, it  
should be understood clearly that these descriptions are  
30 made only by way of example and are not intended to limit  
the scope of the invention.

-18-

## 1 CLAIMS:

1. In an athletic shoe sole of the type having a main sole surface and cleats extending therefrom, and  
5 having heel, arch, ball-of-the-foot and toe portions, the improvement comprising:

-an annular cleat set projecting from the main sole surface and disposed along a substantially circular path which encompasses a major area of the toe and  
10 ball-of-the-foot portions, the set having a plurality of cleat nodes each of which is arranged in a substantially abutting relationship to at least one adjacent cleat node; and  
-each of the cleat nodes having a distal end spaced  
15 from the main sole surface and first and second edges on opposite sides of the distal end, the edges having proximal ends which terminate substantially on the circular path.

2. The athletic shoe sole of claim 1 wherein each of  
20 the cleat nodes comprises a base portion which is joined to the main sole surface and has a length measured generally along the path and a thickness measured generally radially to the path, the length being substantially greater than  
25 the thickness, whereby the cleat set provides excellent pivotability of an athletic shoe and excellent resistance to forces urging the shoe laterally or longitudinally.

3. The athletic shoe sole of claim 2 wherein when  
30 the cleat nodes are in contact with the ground, each of the edges defines with the ground an acute included angle, thereby reducing resistance of the sole to pivoting motion.

4. The athletic shoe sole of claim 3 wherein the  
35 abutting relationship occurs at the base portions of abutting cleat nodes.

-19-

1. 5. The athletic shoe sole of claim 3 wherein:  
-each of the cleat nodes includes a shoulder portion  
located intermediate the distal end and the main sole  
surface; and  
5 -the abutting relationship occurs at the shoulder  
portions of abutting cleat nodes.

6. The athletic shoe sole of claim 3 wherein the  
abutting relationship occurs at the distal ends of the  
10 abutting cleat nodes.

7. The athletic shoe sole of claim 1 wherein each of  
the first and second edges forms an acute angle with the  
main sole surface, thereby further facilitating pivoting.  
15

20

25

30

35

-20-

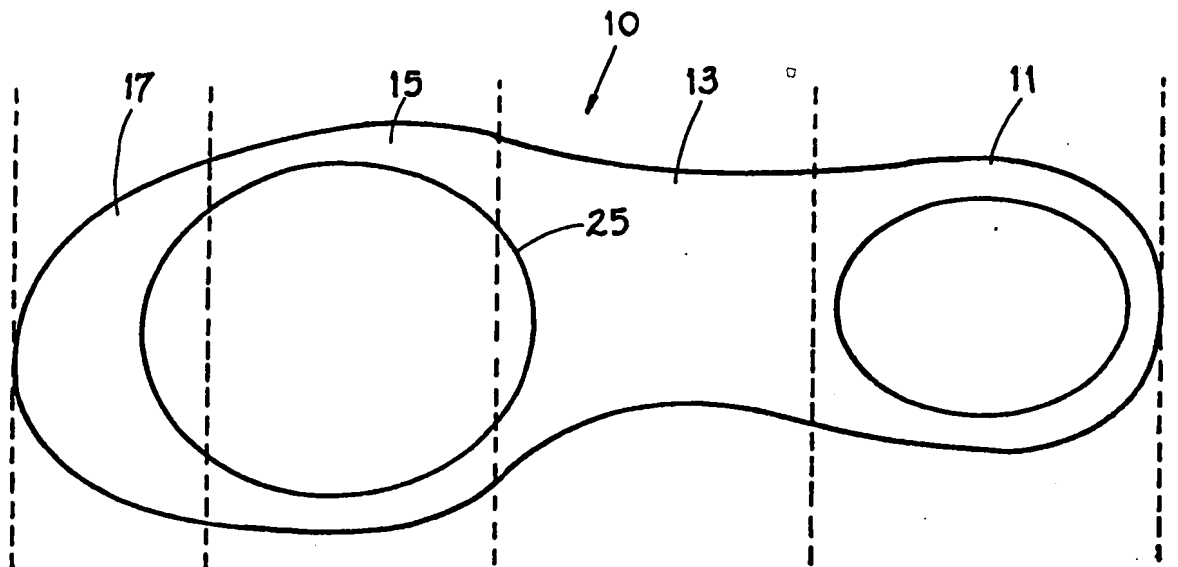
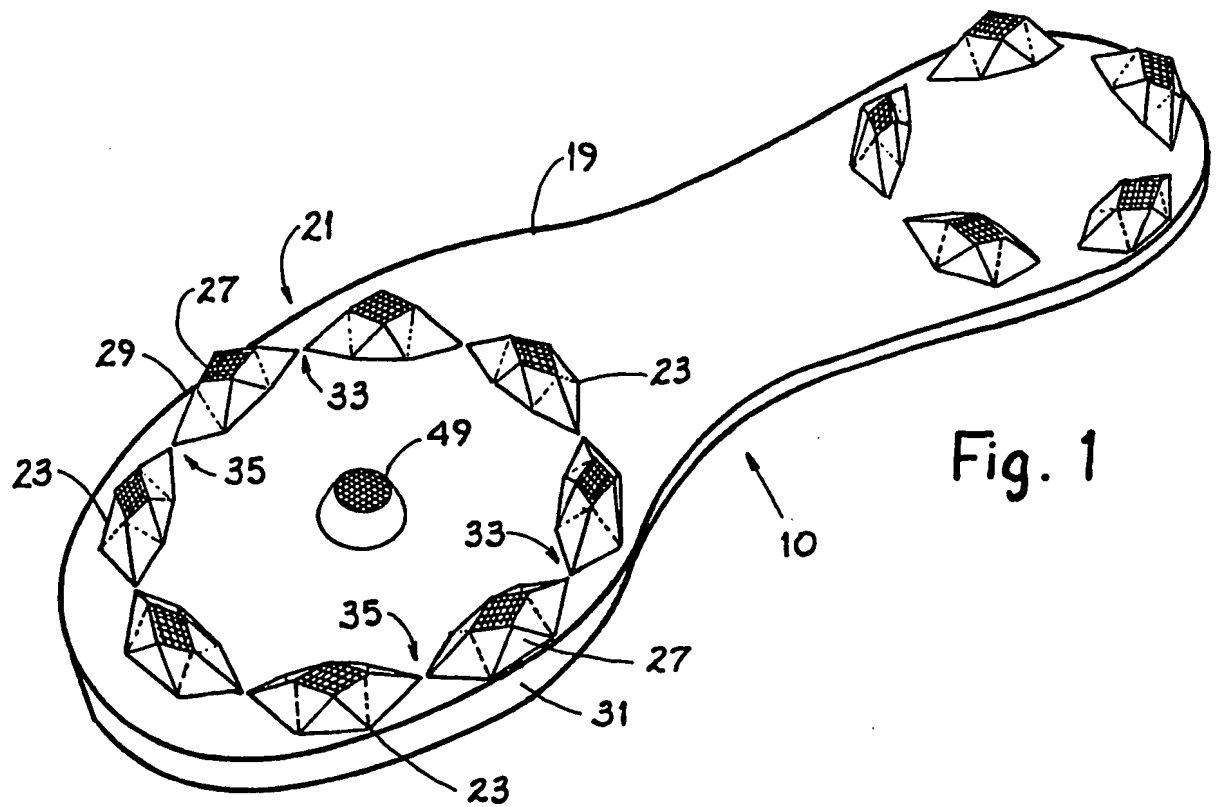
1           8. In an athletic shoe sole of the type having a  
main sole surface and cleats extending therefrom, and  
having heel, arch, ball-of-the-foot and toe portions, and  
opposite lateral and medial side portions, the improvement  
5 comprising:

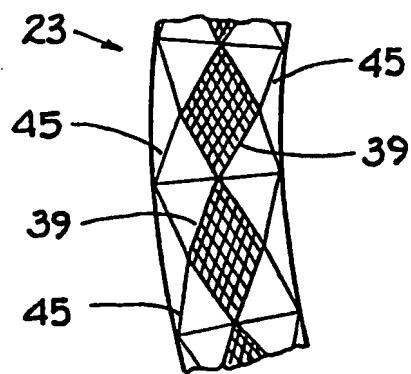
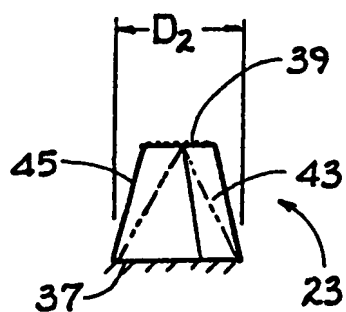
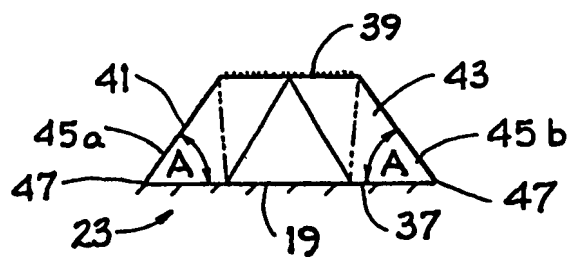
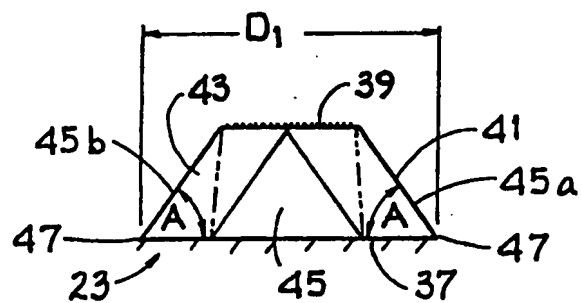
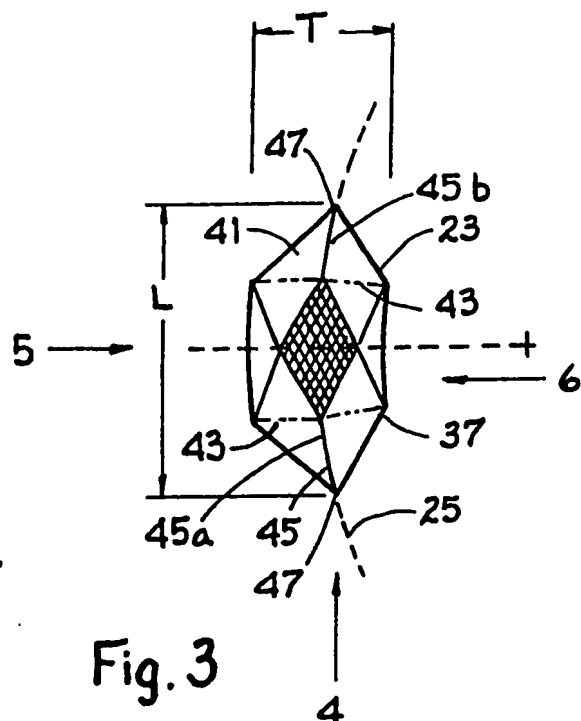
-an annular cleat set projecting from the main sole  
surface and disposed along a substantially circular  
path which encompasses a major area of the toe and  
ball-of-the-foot portions, the set having a plurality  
10 of tapered cleat nodes, at least one of said cleat  
nodes having a radially-outer surface generally  
coincident with the medial side portion and at least  
one other of said cleat nodes having a radially-outer  
surface generally coincident with the lateral side  
15 portion; and  
-each adjacent pair of tapered cleat nodes defining a  
generally V-shaped space therebetween, a plurality of  
opposed pairs of the spaces forming a plurality of  
cross-sole breaks in the annular cleat set.

20           9. The athletic shoe sole of claim 8 wherein each of  
the cleat nodes is tapered in two dimensions, a first  
dimension measured generally parallel to the path and a  
second dimension measured generally radially to the path,  
25 thereby providing a tip of reduced area.

10. The athletic shoe sole of claim 8 wherein:  
-each of the cleat nodes includes multiple planar  
surfaces and edges at the intersections of pairs of  
the planar surfaces;  
30 -the edges include a leading edge and a trailing  
edge, said leading and trailing edges each formed by  
intersection of two of said planar surfaces having an  
acute angle therebetween; and  
-each of the leading and trailing edges defines an  
35 acute angle with the main sole surface,  
whereby ground penetration and pivoting movements are  
facilitated.

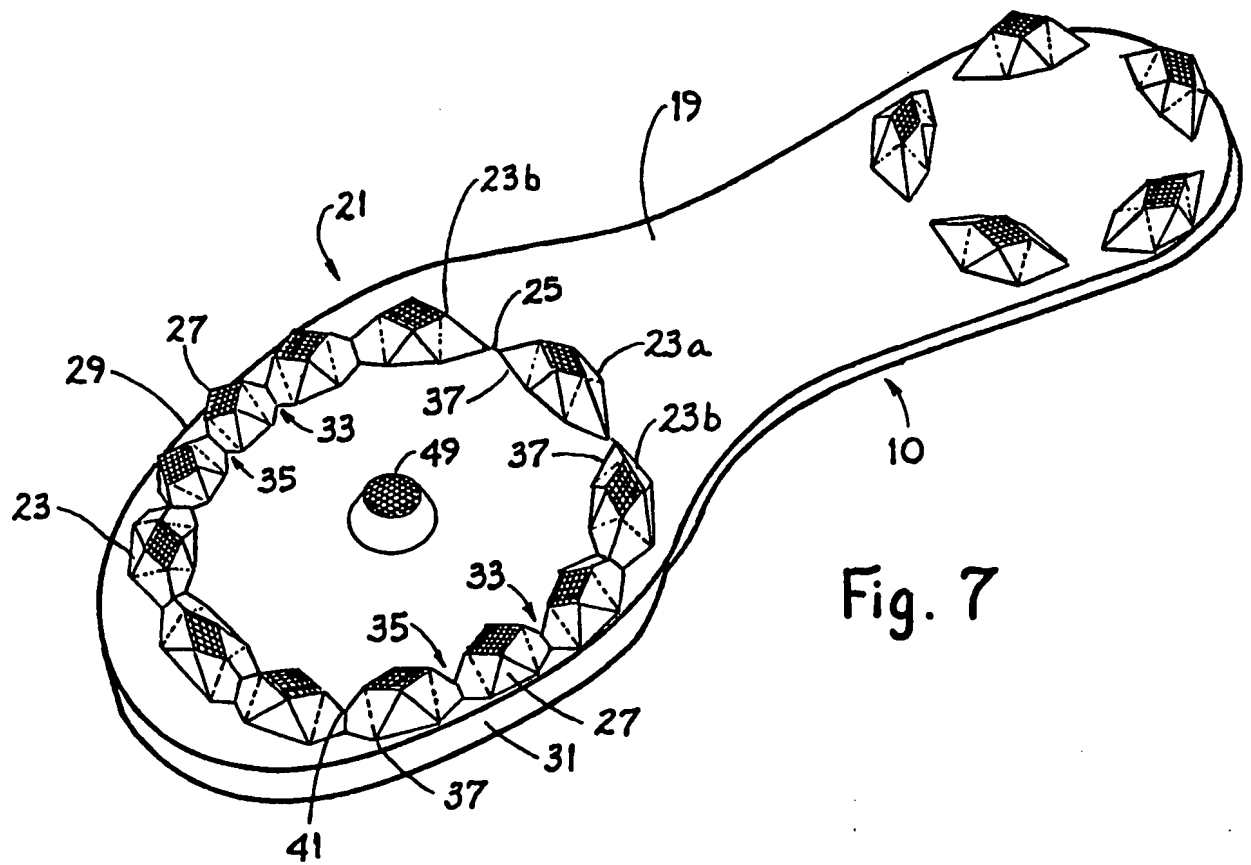
1/3







3/3



# INTERNATIONAL SEARCH REPORT

International Application No **PCT/US90/05232**

## I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) <sup>2</sup>

According to International Patent Classification (IPC) or to both National Classification and IPC

**INT (5): A43B 5/02, 5/00; A43C 15/16**

**U.S. CL.: 36/126, 128, 134, D2/320**

## II. FIELDS SEARCHED

Minimum Documentation Searched <sup>4</sup>

Classification System

Classification Symbols

**U.S. 36/134, 126, 128, 32R, 59C, 59R, 67R, 67A  
D2/320, 311**

Documentation Searched other than Minimum Documentation  
to the Extent that such Documents are Included in the Fields Searched <sup>5</sup>

## III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>1\*</sup>

Category <sup>\*</sup> Citation of Document, <sup>1\*</sup> with indication, where appropriate, of the relevant passages <sup>1\*</sup> Relevant to Claim No. <sup>1\*</sup>

X Y	US, A, 4,689,901 (IHLENBURG) 01 September 1987 See entire document	8-9 1-4,6-7, 10
Y	US, A, 4,641,438 (LARD ET AL) 10 February 1987 See entire document	1-4, 6-7, 10
Y	US, A, 4,501,077 (YOUNG) 26 February 1985 See entire document	6
A	US, A, 4,392,312 (CROWLEY ET AL) 12 July 1983	
A	US, A, 4,255,874 (SIRONI) 17 March 1981	
A	US, A, 3,581,414 (CRAWFORD) 01 June 1971	
A	US, A, D295,231 (HEYES) 19 April 1988	
A	US, A, D294,655 (HEYES) 15 March 1988	
A	IT, A, 432,510 (MARCHEITTO) 20 March 1948	
A	CH, A, 294,324 (CONTINENTAL) 15 November 1953	
A	CH, A, 224,626 (SPINI) 01 March 1943	

\* Special categories of cited documents: <sup>1\*</sup>

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

## IV. CERTIFICATION

Date of the Actual Completion of the International Search <sup>2</sup>

Date of Mailing of this International Search Report <sup>3</sup>

**22 OCTOBER 1990**

**25 JAN 1991**

International Searching Authority <sup>1</sup>

Signature of Authorized Officer <sup>2\*</sup>

**ISA/US**

**STEVEN N. MEYERS**